

# Hydrogenous Polymer-Regolith Composites for Radiation-Shielding Materials, Phase II

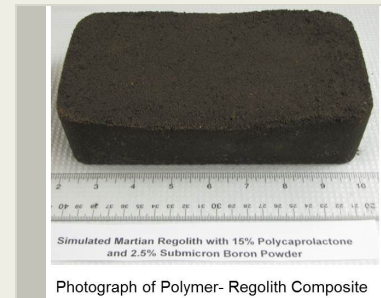
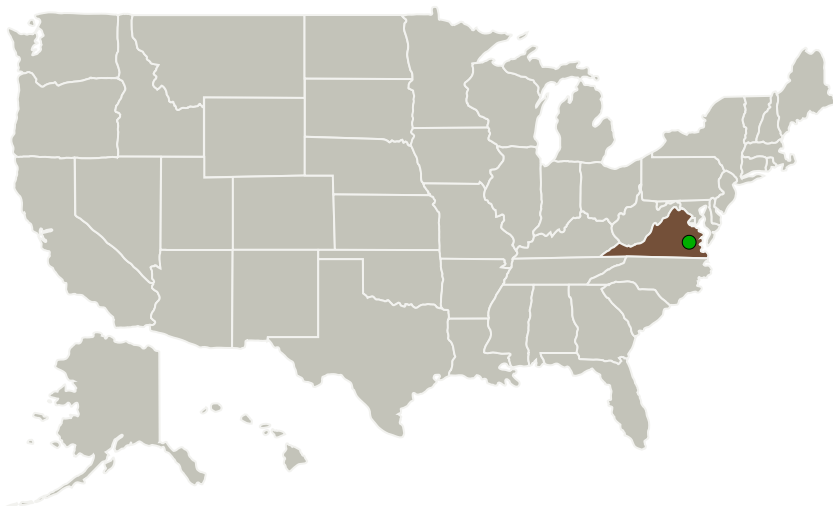
Completed Technology Project (2016 - 2018)



## Project Introduction

NASA has identified a need in Sub-topic H11.01 for advanced radiation-shielding technologies using in situ resources, such as regolith, to protect humans from the hazards of galactic cosmic radiation (GCR) during extra-terrestrial missions. The radiation species of greatest interest are light ions (particularly protons), heavy ions (such as iron-56) and neutrons. International Scientific Technologies, Inc., in conjunction with The College of William and Mary, proposes the use of regolith combined with hydrogenous polymers to develop radiation-shielding structural materials for habitats. The program Technical Objectives include analysis of polymer-regolith specimens to supplement the empirical results of the Phase I program, fabrication of polymer-regolith materials and structures for use as radiation shields, acquisition of families of test data to determine key parameters of polymer-regolith structures for stopping galactic cosmic radiation on the Mars surface, and design of polymer-regolith bricks for habitat construction of the Mars surface. The innovation is the development of polymer-regolith composites and their efficient fabrication for structural radiation-shielding materials to protect humans on deep-space missions. The anticipated result is the creation of composite materials that combines in situ resource utilization (ISRU), i.e. regolith, with a hydrogenous polymeric matrix. Additives, such as boron, could be included to enhance absorption of neutrons generated by interactions of GCR and SPE particles with shielding materials. The proposed composites have multifunctional properties of radiation shielding against galactic cosmic radiation, neutrons and electromagnetic radiation, and structural integrity to permit use in habitats.

## Primary U.S. Work Locations and Key Partners



Photograph of Polymer-Regolith Composite

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Organizations Performing Work	Role	Type	Location
International Scientific Technologies, Inc.	Lead Organization	Industry	Dublin, Virginia
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

## Primary U.S. Work Locations

Virginia

## Project Transitions

**April 2016:** Project Start**April 2018:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139444>)

## Images



### Briefing Chart Image

Hydrogenous Polymer-Regolith Composites for Radiation-Shielding Materials, Phase II  
(<https://techport.nasa.gov/image/133222>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

International Scientific Technologies, Inc.

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

Russell J Churchill

### Co-Investigator:

Eugene C Aquino

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## Technology Maturity (TRL)

Start: **3**  
Current: **5**  
Estimated End: **5**



## Technology Areas

### Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - └ TX06.5 Radiation
    - └ TX06.5.3 Protection Systems

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System